BIOLOGICAL ASSESSMENT IN THE SACRAMENTO AND SAN JOAQUIN WATERSHEDS (FALL 2002 THROUGH SPRING 2004)

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Background

Bioassessment is a survey of the physical habitat and biological community of a water body to determine the integrity or current condition of that aquatic environment. Using the biological community instead of just one species allows for a more comprehensive determination of the health of a water system. Aquatic benthic macroinvertebrates (BMI) are commonly monitored in bioassessment studies because they are ubiquitous, complete the majority of their life cycle in water, and are relatively stationary. They are useful in evaluating the overall health of a water system in flowing waters because they are affected by changes in a stream's chemical composition and/or physical structure. The variety of species and population sizes present in the stream are reflective of the overall health of that biological community and can be used as water quality indicators.

Objective

The objective of this project was to establish baseline aquatic biological community structure and physical habitat conditions in two wadable streams:

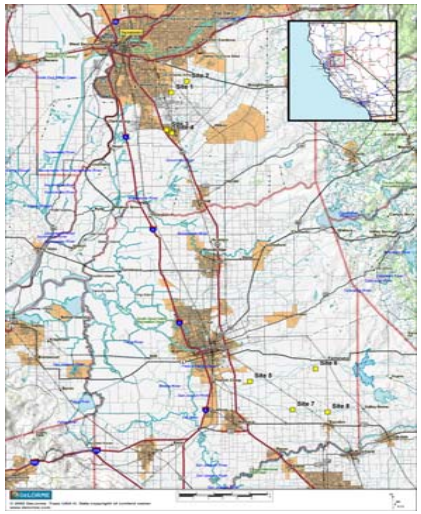
- one dominated by agriculture
- one dominated by urban development

DPR collaborated with the Central Valley Regional Water Quality Board (CVRWQCB) on this project to assist them with their bioassessment monitoring and data collection needs.

Study Plan

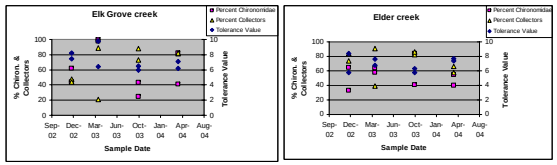
Four creeks were selected: Elk Grove and Elder, urban dominated creeks; and Little John and Lone Tree, agriculture dominated creeks. Monitoring was conducted in the fall and spring for two years.

- Physical habitat assessments were completed for each reach, along with the collection and analysis of water, sediment and BMI samples. Water samples were analyzed for selected organophosphates, pyrethroids, and triazines, and sediment samples were analyzed for pyrethroids.
- Physical habitat assessments and BMI sampling followed DPR SOP #FSWA010.00, Instructions for Sampling Benthic Macroinvertebrates in Wadable Waters Using the Multi-habitat Method (modified U.S. EPA method) during year one and DPR SOP #FSWA015.00, Instructions for sampling benthic macroinvertebrates in wadable waters using the Modified U.S. EPA EMAP method during year two.

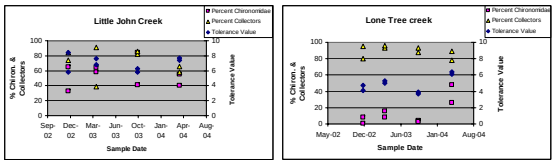


Lone Tree Creek

URBAN CREEKS



AGRICULTURE CREEKS



Elk Grove Creek

Results

Water quality parameters: Temperature and pH were within normal ranges over the 2-year period. Specific conductance was also within normal ranges in the urban creeks, but 25% of the time dropped below normal ranges in agriculture creeks, most likely due to the use of these creeks for transport of irrigation supply waters. Dissolved oxygen fell below normal ranges 15% of the the time in urban sites and 6% of the time in agriculture sites. (Normal ranges are accepted U.S.EPA and CA State Water Resources Control Board criteria for freshwater organisms.)

Physical habitat scores: Physical habitat scores can range from 0 to 200, with 0 being the most impacted by anthropogenic activities and 200 being the least impacted. Though these scores are informative, they can be subjective due to the background and experience of the assessors. Physical habitat scores ranged from 37-124, with the highest scores being at one agriculture creek. Scores were consistent over the 2-year period.

Pesticide detections: There were numerous detections of diazinon and chlorpyrifos detected at all sites, ranging from trace to 0.212ppb and trace to 0.163ppb, respectively. Diuron was also detected at all sites with concentrations ranging from 0.174 ppb to 14.24 ppb. Pyrethroids were only detected in the urban creeks and consisted of three detections of bifenthrin in water (trace to 27.5ppt) and one trace detection of permethrin in sediment.

BMIs - Preliminary review of results indicate:

- Seasonal BMI variation is inconsistent – chironomidae numbers are higher in the spring in agriculture creeks, and vary each season in urban creeks, and the limited baetidae numbers are highest in the fall in urban sites and vary in agriculture sites.
- Both creeks appear to have stressed environments:
  - Urban creeks have higher *tolerance values* than agriculture creeks indicating more pollution tolerant individuals. (*Tolerance Values* represent BMI community tolerance to organic pollution, and were obtained from CA Dept. of Fish & Game, CAMLnet, 2003.)
  - The high number of BMIs in the chironomidae family found at all sites, relative to baetidae and hydropsychidae families, are indicative of a stressed environment.
  - The imbalance of feeding groups found at all sites (collectors/gatherers dominant at 80% of the sampling events) also reflects a stressed environment.